

**Utah Department of Transportation**



**Supplemental Specifications  
for**

**2004 Standard  
Specifications**

**FOR ROAD AND BRIDGE  
CONSTRUCTION**

**U.S. Standard Units (Inch-Pound Units)**

**Issued November 23, 2004**

# Memorandum

UTAH DEPARTMENT OF TRANSPORTATION

**DATE:** November 23, 2004

**TO:** Holders of Hard Copy of Standard Specifications

**FROM:** Barry Axelrod, CDT  
Standards and Specifications

**SUBJECT:** Supplemental Specifications Distribution, dated November 23, 2004

Applicable files for the change are attached. Maintain these files as a supplemental update to the UDOT Standard Specifications dated March 15, 2004. No pages are to be removed or replaced in the basic book, electronic or hard copy.

If you are in need of electronic copies of any Standard or Supplemental Specification please refer to the Standards and Specifications Web site at <http://www.udot.utah.gov/index.php?m=c&tid=302>. From there select the **2004 Standards** subtopic.

If you have any questions or problems with the electronic files contact me at 801-964-4570 or by email at [baxelrod@utah.gov](mailto:baxelrod@utah.gov).

Attachments

## **Listing of Supplemental Specifications**

### **Issue Date: May 27, 2004**

Revised April 29, 2004

- Section 01554M Article 3.2 A1b (deleted)
- Section 01721 Entire section revised to correct oversight. Article 3.5 H (added).  
Replaces Standard Specification. (See September 8, 2004 Issue for replacement.)
- Section 02822M Article 2.4 B (revised)
- Section 13551 Entire section revised. Replaces Standard Specification.
- Section 13552 Entire section revised. Replaces Standard Specification.
- Section 13553 Entire section revised. Replaces Standard Specification.
- Section 13554 Entire section revised. Replaces Standard Specification.
- Section 13555 Entire section revised. Replaces Standard Specification.
- Section 13556 Entire section revised. Replaces Standard Specification.
- Section 13557 Entire section revised. Replaces Standard Specification.
- Section 13561 New section added.
- Section 13591 Entire section revised. Replaces Standard Specification.
- Section 13592 Entire section revised. Replaces Standard Specification.
- Section 13593 Entire section revised. Replaces Standard Specification.
- Section 13594 Entire section revised. Replaces Standard Specification.
- Section 13595 New section added.

### **Issue Date: July 13, 2004**

Revised June 24, 2004

- Section 02751 New section added.
- Section 02961M Articles 1.2, 2.1, and 3.1 (revised)
- Section 02963M Articles 1.2 and 2.1 (revised)
- Section 02968 Section deleted
- Section 02981 New section added.

### **Issue Date: September 8, 2004**

Revised August 26, 2004

- Section 01455M Article 1.5 and 1.6 (revised)
- Section 01721 Entire section reissued with addition of Article 3.3C. Replaces Supplemental issued May 27, 2004.
- Section 02753 Entire section revised. Replaces Standard Specification.
- Section 02754 New section added.
- Section 02771M Articles 2.5 and 3.6 added. Article 3.3E deleted.

## **Issue Date: November 23, 2004**

Revised October 21, 2004

Section 01452M Articles 1.1 and 3.1 and Table 1 and 3 replaced.

Section 02221 Entire section revised. Replaces Standard Specification.

Section 02222 Section deleted

Section 02224 Section deleted

Section 02316M Articles 1.1, 1.2, and 3.9 replaced and 1.6 E added.

Section 02374 New section added.

Section 02610 Entire section revised. Replaces Standard Specification.

Section 02748M Articles 2.2 and 3.3 replaced.

Section 06055 Entire section revised. Replaces Standard Specification.

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**Section 01452M**

**PROFILOGRAPH AND PAVEMENT SMOOTHNESS**

**Delete article 1.1 and replace with the following:**

**1.1 SECTION INCLUDES**

- A. Materials and procedures for smoothness testing of (HMA) Hot Mix Asphalt, Open Graded Surface Course (OGSC), Stone Matrix Asphalt (SMA) and Portland Cement Concrete Pavement (PCCP).
- B. Requirements for 25-foot wheel base, California type profilograph with electronic data recording, storing, data reduction, and printing capabilities.

**Delete article 3.1 and replace with the following:**

**3.1 HMA, SMA AND OGSC**

- A. Construction Requirements
  - 1. Construct finished pavement to meet the surface requirements in Table 1.
  - 2. Identify defects exceeding the limits in Table 1 and correct prior to acceptance testing.
    - a. Analyze the profile using 0.2 inch blanking band.
    - b. Correct defects across the entire width of the traffic lane or shoulder either by grinding with a device approved by the Engineer, or by milling and filling as directed by the Engineer.
    - c. Re-profile for correction verification prior to acceptance testing.
  - 3. Correct transverse defects where the pavement surface varies more than 1/8 inch from the lower edge of a 10 foot straightedge placed perpendicular to the centerline of the roadway.
  - 4. Seal ground areas with asphalt tack coat and blotter material.
    - a. Use a tack coat application rate between 0.07 and 0.14 gal/yd<sup>2</sup>.
    - b. Meet blotter material requirements in Section 02748.
  - 5. The Department inspects acceptance testing prior to the placement of Chip Seal Coat, when applicable.

B. Incentive/Disincentive - HMA

1. Incentive/Disincentive applies only to Class I surfaces for each pavement section defined in this Section, Article 1.4, paragraph B.
  - a. Incentive/Disincentive is calculated according to Table 2, with partial sections prorated based on length.
  - b. Incentive/Disincentive does not apply to HMA surfaces on projects requiring OGSC or SMA.
  - c. Any section requiring grinding exceeding 20 yd<sup>2</sup> does not qualify for incentive. Disincentive remains applicable for sections where grinding exceeds 20 yd<sup>2</sup>.
2. Any section still requiring corrective work that is identified at the time of acceptance testing results in loss of incentive for the section. Disincentives remain applicable and are based on PI obtained at the time of acceptance testing.
3. Failure to correct defects, identified at the time of acceptance testing, within 14 calendar days after notification by the Engineer results in liquidated damages assessed at \$100.00 per day after 14 calendar days per each section needing corrective work.
  - a. Liquidated damages may be waived by the Engineer if it is determined to be in the best interests of the Department to defer corrective work.

C. Incentive/Disincentive - OGSC and SMA Surfaces

1. Incentive/Disincentive applies only to Class I surfaces for each pavement section defined in this Section, article 1.5, Acceptance.
  - a. Incentive/Disincentive is calculated according to Table 3, with partial sections prorated based on length.
2. Any section requiring grinding exceeding 20 yd<sup>2</sup> or any section still requiring corrective work that is identified at the time of acceptance testing results in a disincentive of \$1000.00 per section.
3. Failure to correct defects, identified at the time of acceptance testing, within 14 calendar days after notification by the Engineer results in liquidated damages assessed at \$100.00 per day per each section needing corrective work.
  - a. Liquidated damages may be waived by the Engineer if it is determined to be in the best interests of the Department to defer corrective work.

Delete Table 1 and replace with the following:

<b>Table 1 Surface Requirements</b>				
<b>Pavement Category</b>	<b>Class I Surface</b>		<b>Class II Surface</b>	
	<b>Section PI</b>	<b>Profile Deviation</b>	<b>Section PI</b>	<b>Profile Deviation</b>
<b>Category</b>	<b>in/mi</b>	<b>in/25ft</b>	<b>in/mi</b>	<b>in/25ft</b>
1	5	0.3	N/A	0.3
2	7	0.3	N/A	0.3
<b>Category 1</b>	National Highway System and Truck Routes (See Section 02741, Table 11) and all other routes with surfaces having three or more opportunities for improving the ride.*			
<b>Category 2</b>	All other routes incorporating single lift overlays with not more than two opportunities for improving the ride.*			
<b>Class I</b>	Surfaces consist of all through traffic and climbing lanes, passing lanes, acceleration and deceleration lanes, shoulders, ramps and turn lanes longer than 1000 ft, including bridges and bridge approach slabs with final riding surfaces placed on the contract. Excluded are horizontal curves having a centerline radius of curvature less than 900 ft and areas within the superelevation transitions to these short radius curves.			
<b>Class II</b>	Surfaces consist of all tapers, road approaches, mainline pavement sections with posted regulatory speeds less than 35 MPH, pavement within 15 ft of bridge decks and approach slabs not paved as part of the project, pavement to a point 50 ft beyond the paving limits of the project and all other surfaces not included in Class 1 and surfaces excluded due to horizontal curves.			

\* Each opportunity to improve the ride is one of the following: Placing a gravel or treated base course, OGSC, SMA, rotomilling, cold recycling, and each lift of paving. Leveling is not considered as an opportunity to improve the ride.

**Delete Table 3 and replace with the following:**

<b>Table 3 OGSC &amp; SMA</b>	
<b>Category</b>	<b>Incentive/Disincentive per Section</b>
<b>1</b>	<b>\$150 x [(Required in/mi) - (PI)]</b>
<b>2</b>	<b>\$100 x [(Required in/mi) - (PI)]</b>

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**SECTION 02221**

**REMOVE STRUCTURE AND OBSTRUCTION**

**Delete Section 02221 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Remove, dispose of, or salvage buildings, fences, structures, pavements, curb, gutter, driveways and approaches, sidewalk and similar hard surfaces, abandoned pipelines or utility items and other obstructions that interfere with construction on or off the site including, but not limited to, foundations, bridges, culverts, guardrail, concrete work, septic tanks, trees, etc.
- B.      Salvage as specified, or dispose of in an approved manner.

**1.2      RELATED SECTIONS**

- A.      Section 00727: Control of Work
- B.      Section 01355: Environmental Protection
- C.      Section 02056: Common Fill
- D.      Section 02705: Pavement Cutting
- E.      Section 03055: Portland Cement Concrete

**1.3      PROJECT/SITE CONDITIONS**

- A.      Protect adjacent structures and utilities and their contents that are designated to remain.

## **PART 2      PRODUCTS**

### **2.1      CONCRETE**

- A.      Use Class A Concrete. Refer to Section 03055.

### **2.2      COMMON FILL**

- A.      Refer to Section 02056.

## **PART 3      EXECUTION**

### **3.1      PREPARATION**

- A.      Review all work procedures with Engineer.
- B.      Coordinate utility location in accordance with Section 00727.
  - 1.      Locate and protect all active utilities.
  - 2.      Before beginning work:
    - a.      Notify Engineer
    - b.      Notify all affected utilities
    - c.      Blue Stake the area
- C.      Restore utility services disturbed by construction operations.
- D.      Disconnect water service by excavating to the corporation stop and turning it off. Disconnect the service line from the corporation stop.
- E.      Plug disconnected storm drains or sewer lines near the right-of-way line with a watertight concrete plug extending at least 2.0 ft into the remaining pipe.
- F.      Remove existing septic tanks, cesspools, leach lines, etc.
- G.      All materials not designated for use or salvage becomes the property of the Contractor unless owned by a utility company.
- H.      Excavate all material necessary to permit removal of structure.

### **3.2 BACKFILL AND COMPACTION**

- A. Fill all holes or pits resulting from removal operations with suitable material.
- B. Compact the backfilled areas to the density of the surrounding ground, or as specified.
- C. Department will pay separately for material used for backfilling as "Roadway Excavation," or "Borrow." If no appropriate material item is included in the bid proposal, it will be considered incidental to the work.

### **3.3 REMOVAL AND DISPOSAL**

- A. Remove and dispose of all material promptly using methods acceptable to the Engineer and in accordance with all applicable rules and regulations.
  - 1. Include all excavation, removal, transportation and disposal costs in the item of work.
- B. Repair any damage to adjacent area at no additional cost to Department.
- C. Remove all concrete to at least 2.0 ft below the finished grade, or 2.0 ft below the natural ground surface, whichever is lower.
- D. Obtain all required permits and provide an environmentally safe area for disposal of removed items. Refer to Section 01355.
- E. Dispose of removed obstructions at a site secured by the Contractor. Furnish the Engineer with a copy of the disposal permits or agreements.

### **3.4 BUILDING, BASEMENT, AND FOUNDATION DEMOLITION**

- A. Move or demolish designated buildings including basements, foundations, sidewalks, pavement slabs, porches, fences and outbuildings on each parcel.
- B. The Department is not responsible for any vandalism or theft that occurs to the building or its contents that reduces the value of the salvage or increases the cost of removal after the award of the Contract.
- C. Break the floor into pieces not over 3.0 ft<sup>2</sup> in areas to remain in place. Remove and dispose of pieces over 3.0 ft<sup>2</sup>.
- D. Include in other items of work, payment for obstructions shown on the plans for removal but not having a bid item included in the proposal.

### **3.5 BRIDGE, BOX CULVERT DEMOLITION**

- A. Arrange detours for traffic flow according to traffic control plans.
- B. Excavate all material necessary to permit removing structure.
- C. Remove structure so that no remaining portion is closer than 3.0 ft to any watercourse or closer than 2.0 ft to the subgrade and embankment surface or within 2.0 ft of the natural ground surface.
- D. Remove all structures that will interfere with proposed construction.
- E. Complete blasting or other removal operations of existing structure that may damage new construction before placing the new work.

### **3.6 MANHOLE, CLEANOUT, DIVERSION, AND CATCH BASIN REMOVAL**

- A. Maintain satisfactory by-pass service during construction operations.
- B. Plug unused sewers with a 2.0 ft long concrete plug.

### **3.7 CATTLE GUARD REMOVAL**

- A. Remove the cattle guard to at least 2.0 ft below the subgrade surface.
- B. Excess materials become the Contractor's property, unless otherwise designated.

### **3.8 SEPTIC TANK, UNDERGROUND TANK REMOVAL**

- A. Empty and dispose of tank contents in accordance with Section 01355.
- B. Break down and remove tank and appurtenances to at least 2.0 ft below the subgrade surface or finished ground lines.
- C. Break the floor into pieces not over 3 ft<sup>2</sup> in area.

### **3.9 BURIED FUEL TANK DEMOLITION**

- A. Remove buried fuel storage tanks and dispose of tank contents in accordance with all applicable Laws and Regulations.
- B. Do not spill fuel on subgrade.

- C. Comply with the State and local authorities having jurisdiction over fuel tank removals.

### **3.10 GUARDRAIL REMOVAL**

- A. Remove and dispose of guardrail, posts, hardware, anchor assemblies, terminal assemblies, and attached posts, signs, and delineators.
- B. For steel posts, remove to a minimum of 8.0 inches below the subgrade surface or finished ground lines.

### **3.11 FENCE REMOVAL**

- A. Prevent people or livestock from entering work site from adjacent properties during removal and installation procedures.
- B. Remove fence, posts, and foundations to at least 2.0 ft below subgrade or finished ground lines.
- C. Do not damage vegetation and ground cover during removal operations.

### **3.12 RAILROAD TRACK REMOVAL**

- A. Remove all rails, ties, paving, track encasement, and other appurtenances.
- B. Leave crushed stone or gravel ballast. Grade as necessary.

### **3.13 TREE REMOVAL**

- A. Remove all trees with a circumference larger than 20 inches measured at a point 2.0 ft above existing ground.
  - 1. A tree consists of stump, root, trunk, branches, and foliage.
  - 2. Multiple leaders rising from a common root will not be counted separately.
  - 3. Remove the root system to a minimum depth of 2.0 ft below the finished ground level and within a 2.0 ft radius of the stump.
  - 4. When there is no bid item included in the proposal for "Tree Removal:"
    - a. This work is considered incidental to other items of work and no separate measurement or payment will be made.
    - b. Include all costs in other items of work.
- B. Trees removed with a circumference 20 inches or less, measured at 2.0 ft above existing ground are considered incidental construction.

### **3.14 CONCRETE HEADWALL REMOVAL**

- A. Remove headwalls where designated.
- B. Replace pipes or structural plate pipes damaged while removing headwall at no additional cost to the Department.

### **3.15 UTILITY POLE REMOVAL**

- A. Remove pole and all appurtenances.
- B. Remove foundation to at least 2.0 ft below subgrade or natural ground.

### **3.16 PIPE CULVERT REMOVAL**

- A. Excavate all material necessary to permit removing pipe culvert, end sections, headwalls, etc.
- B. Plugs:
  - 1. Cut existing pipe culvert 2.0 ft inside the Department's right-of-way, and abandon culvert located on private property.
  - 2. Plug disconnected pipelines near the right-of-way line with a water-tight concrete plug extending into the remaining pipe at least 2.0 ft.
- C. Seal openings in walls of remaining manholes or catch basins with watertight concrete plug.

### **3.17 PAVEMENT REMOVAL**

- A. Cut existing pavement on the designated lines with straight vertical edges free from irregularities when joining new construction to existing pavement. Refer to Section 02705.
- B. Completely remove pavement down to the underlying base course or subgrade.

### **3.18 OBLITERATE ROAD**

- A. Break up pavement into pieces not over 1 ft<sup>2</sup> in area. Scarify and cover broken concrete with at least 1 ft of suitable backfill material.
- B. Fill depressions and form rounded slopes to blend with the natural or surrounding contours.

- C. Grade materials either along the toe of an embankment or into a depression or borrow pit. Cover with at least 1 ft of suitable backfill material.

### **3.19 CONCRETE SIDEWALK, CONCRETE DRIVEWAY REMOVAL**

- A. Remove concrete to the nearest expansion joint or saw cut to provide proper grades and connections.
- B. Make concrete cuts straight, vertical to the surface, full depth, and free from irregularities. Refer to Section 02705.
- C. Thoroughly clean all adhering materials from existing reinforcement.
- D. Do not damage concrete designated to remain.

### **3.20 CONCRETE CURB, CONCRETE CURB AND GUTTER, RAISED ISLAND, BITUMINOUS CURB REMOVAL**

- A. Remove curb, curb and gutter, gutters, raised island, bituminous curb, and parts of such improvements to an existing joint or joint sawed with a vertical face.
- B. Remove material to provide proper grades and connections.

### **3.21 SALVAGE**

- A. Salvage designated equipment and materials.
- B. All other materials become the property of the Contractor unless otherwise noted.

END OF SECTION

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**Section 02222**

**SITE DEMOLITION - CONCRETE**

**Delete Section 02222 in its entirety.**

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**Section 02224**

**DISPOSE OF ASPHALT PAVEMENT**

**Delete Section 02224 in its entirety.**

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**Section 02316M**

**ROADWAY EXCAVATION**

**Delete Articles 1.1 and 1.2 and replace with the following:**

**1.1 SECTION INCLUDES**

- A. Excavate all material within designated areas, including channels with a bottom width of 12.0 ft or greater. Widen cuts as directed.
- B. Rock excavation and removal.
- C. Dispose of excavated material in embankment and/or other areas.

**1.2 RELATED SECTIONS**

- A. Section 00820: Legal Relations and Responsibility to Public
- B. Section 01355: Environmental Protection
- C. Section 01571: Temporary Environmental Controls
- D. Section 01721: Survey
- E. Section 02056: Common Fill
- F. Section 02061: Select Aggregate
- G. Section 02075: Geotextiles
- H. Section 02231: Site Clearing and Grubbing
- I. Section 02324: Compaction
- J. Section 02330: Embankment
- K. Section 02705: Pavement Cutting
- L. Section 02912: Topsoil

**Add the following to Article 1.6:**

- E. Payment under this item includes excavation, removal, transportation and disposal of concrete and/or asphalt pavements when measurement is included in Roadway Excavation.

**Delete Article 3.9 and replace with the following:**

**3.9 PAVEMENT**

- A. Cut existing pavement on the designated lines with straight vertical edges free from irregularities when joining new construction to existing pavement. Refer to Section 02705.
- B. Excavate all pavement according to plans.
- C. Dispose of pavement using methods acceptable to the Engineer, in accordance with all applicable rules and regulations, and as follows:
  - 1. Inside the right-of-way for use as embankment, subject to the approval of the Engineer. Refer to Section 02330. Or,
  - 2. Outside the right-of-way: Refer to Section 01355.
    - a. Acceptable when in accordance with all applicable laws, ordinances, regulations, and rules.
    - b. Furnish the Engineer with copies of the disposal permits and/or agreements.

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**SECTION 02374**

**GROUTED RIPRAP**

**Add Section 02374:**

**PART1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Materials requirements and procedures for furnishing, transporting and installing of grouted riprap and all related materials.

**1.2      RELATED SECTIONS**

- A.      Section 03055: Portland Cement Concrete

**1.3      REFERENCES**

- A.      AASHTO T 27: Sieve Analysis of Fine and Coarse Aggregate.
- B.      AASHTO T 99: Moisture Density Relations of Soils Using a 5.5 Lb. Rammer and a 12 inch Drop.
- C.      AASHTO T 180: Moisture Density Relations of Soils Using a 10 lb Rammer and a 18 inch Drop.
- D.      AASHTO M 288: Geotextile Specification for Highway Applications.
- E.      ASTM T 104: Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
- F.      ASTM C 127: Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
- G.      ASTM C 535: Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

- H. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

#### **1.4 SUBMITTALS**

- A. Submit in writing the following at the preconstruction conference:
1. The source for riprap, and gradation.
  2. Grout mix-design.
  3. Samples for quality assurance testing before use.

#### **1.5 QUALITY ASSURANCE**

- A. Grouted Riprap Sample Panel
1. Construct a 4 ft long x 4 ft wide x 1 ½ ft thick sample panel. Integrate the sample panel in the project quantity. Retain samples of cements, sands, aggregates, and additives used in this sample for comparison with materials used in the project. For small quantities (less than 20 square feet), reduce or revise sample panel size according to the resident engineer directions.
  2. Use the accepted 4 ft x 4 ft x 1 ½ ft sample panel as a standard to judge consistent visual appearance, acceptable workmanship, joint treatment, curing, cleaning and construction techniques to be used through out the project.
  3. Remove sample panel upon completion and acceptance of riprap installation.
- B. Riprap Source
1. Set up riprap source location inspection meeting with the Engineer and source material owner prior to delivering materials to project site.
  2. Identify stock piling procedure.
  3. Provide written certification verifying the quality of riprap existing at the industrial source. Certify that “reactive” stone are not found in the quarry pit. Alkali-silica and alkali-carbon reactions are the most frequent of these reactions. In the absence of a documented 10-year history of use of quarry aggregates in commercial concrete mix designs, perform a petrographic analysis on representative aggregate samples to determine whether reactive stones are present.
  4. Provide historic results on reactivity of the rock or petrographic analysis of the proposed materials for rip rap.
- C. Preconstruction Conference
1. Provide
    - a. Proposed source sites
    - b. Material test results

- c. Grout mix design
- d. Quality control plan

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and stock pile enough stone onsite for project.
- B. Prevent contamination of the stone surfaces with clays or similar materials.
- C. Remove any stone that does not conform to this specification.
  - 1. The engineer may reject any stones not conforming to this specification.

## PART 2 PRODUCTS

### 2.1 RIPRAP ELEMENTS

- A. Stone quality
  - 1. Use angular stones that are sound and durable against disintegration, and that have their greatest dimensions no greater than three times their least dimensions.
- B. Meet the following tests minimum requirements for stone.
  - 1. Maximum wear not greater than 40 percent when tested per ASTM C 535.
  - 2. Minimum specific gravity of 2.64 when tested per ASTM C 127.
  - 3. Weighted loss not greater than 10 percent when tested per AASHTO T 104.
- C. Stone gradation
  - 1. For grouted riprap of 1 ½ to 2 feet in thickness provide stones for riprap meeting the gradation requirements detailed in Table 1.

Table 1

Stone Sizes		Gradation (Percent <i>Larger</i> Than Given Stone Size)
Equivalent Diameter (Feet)	Weight	For 1 ½ to 2 foot Grouted Riprap Thickness
2.25	½-Ton	0-5
1.75	¼-Ton	50-100
1.25	200-Lb	- - -
1.00	75-Lb	95-100

- D. Use gradations that allow full grout penetration around the rocks.

## **2.2 GROUT**

- A. Provide grout that meets the following requirements.
  - 1. Minimum 28-day compressive strength of 3000 psi, conform to strength testing requirements of Section 03055.
  - 2. Minimum air content of 5 percent.
  - 3. Use the approved mix design desired by the contractor.
  - 4. Use a minimum of six sacks of type II Portland Cement per cubic yard of grout.
  - 5. Submit a grout mix design that readily flows into the open spaces between the stones with the riprap gradation used.
  - 6. Add 1.5 pounds of fibermesh or equivalent per cubic yard of grout.
  - 7. Do not use calcium chloride admixtures.

## **2.3 ACCESSORIES**

- A. Portland cement: Use Portland cement conforming to Section 03055.
- B. Pozzolan:
  - 1. Use Pozzolans conforming to Section 03055 and specification ASTM C 618. Class F, in amounts not to exceed 25 percent, based on absolute volume.
  - 2. Use an equivalent amount of Portland Cement in the grout mixture as a substitute.
- C. Aggregates: Conform to the requirements of Section 03055.
- D. Water: Use water that conforms to requirement of Section 03055.
- E. Air-entraining admixtures: Refer to Section 03055.
- F. Other admixtures: According to Section 03055.
- G. Use products to clean rock surfaces that are known to be compatible with cementitious grouts. Use in accordance with manufacturer's instructions.

## **2.4 BEDDING MATERIALS**

- A. Conform to AASHTO M 288 for geotextile layer.

- B. Provide a class of geotextile conforming to the requirements for strength detailed in Table 1 of AASHTO M 288 that is appropriate for the installation methods used.
- C. Provide a geotextile conforming to the requirements for subsurface drainage detailed in Table 2 of AASHTO M 288 that is appropriate for the in-situ soils encountered.
- D. Use imported free-draining bedding aggregate material consisting of sand, gravel, or crushed stone meeting the following gradation. Do not use on-site materials.
- E. Provide 6 inches of granular bedding aggregate material under the grouted riprap.
- F. Use Granular Bedding Gradation per AASHTO T 27 meeting Table 2 requirements.

Table 2

U.S. Standard Sieve Size	Percent by Weight <i>Passing</i> Square Mesh Sieves
1 ½ - inch	100
¾ - inch	20-90
⅜ - inch	- - -
No. 4	0-20
No. 100	- - -
No. 200	0-3

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Install surface and ground water control measures as needed to perform work in dry conditions. Water control measures include, but are not limited to diversions, culverts, sumps with pumps or other means necessary to maintain the level of groundwater below subgrade elevation and to divert surface water away from the work area.
- B. Remove all topsoil, loose excavated materials, trees, timber debris, soft yielding material and concrete debris, and other objectionable materials from beneath the areas where the grouted riprap is to be placed and as shown on the plans. Do not block natural drainage layers or horizons within the channel bottom.

- C. Place any approved on-site material and compact as specified to the designated subgrade elevation.
  - 1. Do not backfill depression with shattered shale materials.
  - 2. Spread fill materials uniformly minimizing segregation.
  - 3. Compact subgrade to 95 percent maximum density; AASHTO T 99, or to a 70 percent relative maximum density; AASHTO T 180.
  - 4. Smooth graded areas maintaining specified slope with no more than 3 inches change unless closer tolerances are specified.
- D. Install a free draining bedding layer around the weep drains in the location indicated on the plan sheets.
  - 1. Provide sufficient cover to prevent crushing by riprap elements.
- E. Notify the Engineer before placing riprap elements over bedding layer.
- F. Do not place riprap until the Engineer has verified compaction requirements.

### **3.2 PLACEMENT OF BEDDING MATERIALS**

- A. Place geotextile loosely with no wrinkles or folds.
  - 1. Use care so that the geotextile is in contact with the soil.
  - 2. Eliminate all void spaces between the geotextile and the soil surface.
- B. Overlap adjacent edges of geotextile a minimum of 18 inches or as shown on the plans.
- C. Overlap the upstream geotextile over the downstream.
- D. Repair or replace damaged geotextile at no expense to the owner.
- E. Repair damaged geotextile by placing a geotextile patch, extending 3 feet in all directions beyond the damaged area.
- F. Place free-draining bedding aggregate on the geotextile.
  - 1. Prevent damage to the geotextile.
- G. Place drainage aggregate immediately after placing the geotextile.
- H. Maintain 3 inches minimum bedding aggregate thickness.
  - 1. Finish the surface of the drainage aggregate free of mounds.

### **3.3 PLACEMENT OF RIPRAP ELEMENTS**

- A. Install the riprap in place of the specified depth.
  - 1. Distribute larger stones uniformly.
  - 2. Do not group stones as a substitute for larger stone.
  - 3. Arrange individual stones as necessary by use of equipment or grapple device or hand in order to maintain the specified gradation and interlock.
- B. Provide adequate access when placing stones in the grout to lower portions of the stone to prevent voids from forming.
  - 1. Place stones to secure a stone mass with the minimum thickness and height indicated.
- C. Provide a riprap surface conforming to the lines and grades and adjacent channel surfaces as shown on the plans.
  - 1. Manipulate the stone if necessary to secure a regular surface of graded size and mass stability.
  - 2. Remove any stones projecting above the finished design grade more than 10 percent of the stone layer thickness.
  - 3. Make smooth transition without cutting or breaking stones.
- D. Do not crush the weep drains extending into the underlying granular drain material.
  - 1. Select drain pipe materials that are compatible with the chosen method of riprap placement.
- E. Place all stones in a dry condition beginning at the toe of the slope or other lowest point.
  - 1. Provide weep holes of 3 inch diameter pipe penetrating the bedding with an average spacing not to exceed 10 feet on center at the toes of slopes.
- F. Form all outer edges and the top of grouted riprap where construction terminates, so that the surface of the work is embedded and even with adjacent slope or ground.

### **3.4 GROUTING OF RIPRAP**

- A. Do not place grout mix when the daily minimum temperature is less than 40 degrees F.
  - 1. Maintain at minimum temperature of 50 degrees F and not more than 90 degrees F during the placement and the curing periods.

- B. Do not place on frozen surfaces.
  - 1. Cover the grouted stone and heat within a range of 50 and 90 degrees F for a minimum of 24 hours prior to placing grouting materials when temperature is below 40 degrees F and dropping.
- C. Thoroughly wet riprap, bedrock, and foundation surfaces.
  - 1. Allow excess water to drain.
  - 2. Achieve a dry saturated surface condition.
- D. Use low pressure to inject grout into the voids between stones by pumping through a maximum 2-inch diameter hose.
  - 1. Stop the flow at any time.
- E. Deposit grout to fill all voids as stones are placed.
  - 1. Secure maximum compaction and density of the grout.
- F. Place the grout from bottom to top and use sufficient grout to fill all voids between the stones.
  - 1. Fill all voids with grout from the subgrade level through the stone layer.
  - 2. Grout must penetrate to subgrade.
  - 3. Use a “pencil” vibrator fill all voids between and under stones.
- G. Leave grout joints recessed below the surface of the adjacent stones.
  - 1. Leave the top surface of the stones fully exposed.
  - 2. Immediately remove all excess grout with a stiff brush augmented with a cleaning agent if needed.
- H. Do not use grout to cover the surface of the stone.
  - 1. Construct the grouted riprap having a rustic appearance.
  - 2. Match the workmanship of the sample panel.
- I. Do not clog the weep drainpipes or clog the filter drain materials.
- J. Do not re-temper grout mix by adding water in field.

### **3.5 CURING AND PROTECTION**

- A. Keep exposed surfaces continuously moist for the seven-day curing period.
- B. Maintain moisture by sprinkling, fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand or similar material.
  - 1. Protect the grout during the curing process without causing damage to the grout surface by erosion or other mechanisms during water or moist covering.

END OF SECTION

**Supplemental Specification  
2004 Standard Specification Book**

**SECTION 02610**

**PIPE, PIPE-ARCH, STRUCTURAL PLATE PIPE AND  
STRUCTURAL PIPE ARCH**

**Delete Section 02610 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Materials and procedures for installing pipe.
- B.      Class, type, size, and thickness designations.
- C.      Asphalt coating for pipe.

**1.2      RELATED SECTIONS**

- A.      Section 00820: Legal Relations and Responsibility to Public
- B.      Section 02317: Structural Excavation
- C.      Section 02330: Embankment
- D.      Section 03055: Portland Cement Concrete
- E.      Section 03310: Structural Concrete

**1.3      REFERENCES**

- A.      AASHTO M 36: Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
- B.      AASHTO M 55: Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
- C.      AASHTO M 86: Concrete Sewer, Storm Drain, and Culvert Pipe

- D. AASHTO M 167: Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
- E. AASHTO M 170: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- F. AASHTO M 190: Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
- G. AASHTO M 196: Corrugated Aluminum Pipe for Sewers and Drains
- H. AASHTO M 197: Aluminum Alloy Sheet for Corrugated Aluminum Pipe
- I. AASHTO M 198: Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
- J. AASHTO M 207: Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
- K. AASHTO M 219: Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
- L. AASHTO M 243: Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe Arches, and Arches
- M. AASHTO M 245: Corrugated Steel Pipe, Polymer Precoated, for Sewers and Drains
- N. AASHTO M 246: Steel Sheet, Metallic-Coated and Polymer Precoated for Corrugated Steel Pipe
- O. AASHTO M 294: Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter
- P. AASHTO M 304: Polyvinyl Chloride (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
- Q. AASHTO Standard Specifications for Bridge Construction
- R. ASTM A 849: Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
- S. ASTM C 828: Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines

- T. ASTM C 924: Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
- U. ASTM C 969: Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Sewer Lines
- V. ASTM C 1103: Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
- W. ASTM D 1784: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- X. ASTM D 3212: Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- Y. ASTM D 3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
- Z. ASTM F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- AA. Utah Occupation Safety and Health Regulations

#### **1.4 ACCEPTANCE CRITERIA**

- A. General
  - 1. Pipes are accepted according to the criteria outlined in this section. UDOT approved third party testing can be required of any pipes, irrigation pipes or storm drain systems for compliance with the criteria. The Engineer reviews proposed repairs for acceptance.
  - 2. Base acceptance criteria for installed pipes or pipe systems on the following requirements:
    - a. Horizontal and vertical alignment deviations
    - b. Barrel distortion
    - c. Damage to the pipe
    - d. Joints
    - e. Coating integrity
  - 3. Remove all pipes with a damaged invert.
  - 4. Remove all pipes that have damaged joints that allow the systems to leak.
  - 5. Remove, re-install or replace all pipes that do not connect properly.
  - 6. Remove and replace all pipes that do not have the required coating thickness.

- B. Requirements
1. Horizontal and vertical alignment deviations
    - a. Measure horizontal and vertical installation deviations from the pipe system's final construction survey stakes.
    - b. Do not exceed the tolerances shown in Table 2 in this section.
  2. Barrel distortions
    - a. Use a mandrel, per Article 1.4 paragraph C.3 of this section, or appropriate instruments to measure distortions along a straight line through the centerline of the pipe.
    - b. Do not exceed the tolerances shown in Table 2 in this section.
  3. Damage to the pipe
    - a. Use a video camera as described in Article 1.4 paragraph C.2 to assess and document the general condition of the pipe.
    - b. Note location of any of the following defects: irregular or distorted pipe barrel, cracks, dents, holes, splits, damaged inverts or loose nuts or bolts.
  4. Joints
    - a. The Engineer evaluates joints for compliance with Article 2.4 of this section, the pressure rating requirements and other requirements as indicated in the plans and specifications.
    - b. Provide a manufacturer's Certificate of Compliance for the pipe joints.
    - c. Joint test for irrigation pipe and storm drains for pipe diameter equal or less than 48 inches. Select pipe for testing according to the criteria in Article 1.4 paragraph C.1 and test all pipes that have visible dents, defects, or any other problem according to one the following testing methods:
      - 1) Air Test  
Concrete Pipe – Test according ASTM C 924  
Plastic Pipe – Test according to ASTM C 828 or C 924 and manufacturer recommendations  
Test individual joints according to ASTM C 1103
      - 2) Exfiltration Test  
Test concrete pipe or other pipe material types according to AASHTO M 86 and ASTM C 969. Maintain head for one hour. Do not exceed leakage values in table 1. Locate source or sources of leakage and replace damaged storm drain or irrigation system that does not pass the test.

Table 1 - Leakage Test Allowances

Nominal Pipe Diameter (Inches)	Maximum Leakage Allowed (Gal/hr/100 feet)
18	2.25
24	3
30	3.75
36	4
42	5.25
48	6

5. Coating integrity
  - a. Verify coating integrity and thickness prior to installation.
  - b. Use the video camera, as specified in Article 1.4 paragraph C.2 to assess and document general conditions of the pipe's internal coating.
  - c. Repair localized abrasion, delamination or peeling of the coatings according to manufacturer recommendations.
  - d. Provide a Manufacturer's Certificate of compliance for the pipe coating.

Table 2 - Tolerances

Alignment Tolerances			Distortions	
Design Grade	Max. Line Deviation	Max. Grade Deviation	Nominal Pipe Diameter (1)	Maximum Distortions (2)
	Percent of Nominal Pipe Diameter	inches/100feet	Inches	Inches
> 1 %	5	1 1/2	18	+/- 0 - 7/8
≤ 1 %	5	1	24	+/- 1 - 1/4
< 0.5 %		± 0.5	30	+/- 1 - 1/2
			36	+/- 1 - 7/8
			42	+/- 2
			48 +/-	+/- 2 - 3/8-
<b>Foot Notes</b>	(1) For nominal pipe diameters larger than 48 inches, use measured diameter to calculate 5 percent allowable deflection. (2) Maximum allowable deflections are used to define dimensions associated with allowable pipe deflections. Measure deflections directly or by use of a mandrel test.			

C. Inspection

1. Inspect and test with the Engineer or his representative the cross culverts, storm drain, and irrigation pipe installation prior to placing the roadway pavement.
2. Sample Unit
  - a. A storm-drain or irrigation sample unit is the length of pipe between two man-holes or drainage structures or a cross-culvert.
  - b. Inspect all cross culverts/storm-drain pipes and irrigation pipe when installing less than 5 sample units.
  - c. Inspect 25 percent of all the cross culvert, storm drain installations, and irrigation pipe, selected randomly, when installing more than 5 sample units.
3. Mobile Color Camera
  - a. Provide and use a mobile color video camera and light source to inspect installed pipes up to 48-in diameter.
  - b. Able to move inside the pipe barrel and be controlled remotely by the inspector.
  - c. Have a remote monitor and a recording apparatus to view and record the condition of the installed pipes.
  - d. Provide a digital copy of the pipe inspection video recording to the Engineer.
4. Mandrel Test
  - a. Test pipe by hand pulling a fabricated mandrel through the sample unit.
  - b. Provide and use mandrels to verify that the installed pipes up to 36-inch in diameter meet the criteria in Table 2 of this specification.
  - c. Provide the following:
    - 1) A mandrel, acceptable by the Engineer.
    - 2) A mandrel with an effective diameter equal to 95 percent of the nominal inside diameter.
    - 3) A proving-ring to verify mandrel size.
    - 4) A mandrel with a minimum of nine equally spaced removable and adjustable runners (40 degree angles).
5. Manual Evaluation
  - a. Measure manually any distortions (deflections) of pipe larger than 36-inch in diameter and verify in the presence of the Engineer or his representative that the installed pipes sample meet the criteria in Table 2.

- D. Reduction of Payment
1. Repair or replace damaged or improperly installed pipes in a sample unit at the direction of the Engineer.
  2. Apply the pay reduction schedule in Table 3, for sample units left in place that have pipes that do not meet the deflection requirements of Table 2:

Table 3 - Payment Reductions

<b>PIPE DEFLECTION MEASURED</b>	
Amount of Deflection (%)	Payment
0.0 to 5	100% of the Unit Bid Price
5.1 to 7.5	80% of the Unit Bid Price
7.6 to 8.5	60% of the Unit Bid Price
8.6 to 9.9	50% of the Unit Bid Price
10 or greater	Remove and Replace

## **PART 2 PRODUCTS**

### **2.1 PIPE CLASSES**

- A. Pipe Classes:
1. Class A: Pipe used in mostly non-reactive soils, that require no special materials, treatment, or coating.
  2. Class B: Pipe used in moderately reactive and corrosive soils.
  3. Class C: Pipe used in soils which are highly reactive and corrosive.
  4. Class D: Untreated structural plate pipe used in mostly non-reactive and non-corrosive soils.
  5. Class E: Structural plate pipe used in highly reactive and corrosive soils.
- B. Pipe Class Substitutions: May be made at no additional cost to the Department.
1. Class B and C may be substituted for Class A.
  2. Class C may be substituted for Class B or A.
  3. Class E may be substituted for Class D.
- C. Refer to Table 4.

Table 4: AASHTO Reference Specifications for Pipe

Pipe Type		Pipe Class				
		A	B	C	D	E
<b>Substitutions: Class B and C may be substituted for Class A, Class C may be substituted for Class B or A, Class E may be substituted for Class D.</b>						
<b>1.0</b>	<b>Corrugated Pipe and Pipe Arch:</b>					
1.1	Corrugated steel pipe.	M 36	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 0 µm (inside) / 250 µm (outside) M 245 & M 246 ASTM A 849 or Aluminized Type II Steel M 274 (2)	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 250 µm (inside)/250 m (outside) M 245 & M 246 ASTM A 849	N/A	N/A
1.1(a)	Corrugated steel pipe arch. (1)					
1.2	Corrugated aluminum pipe.	M 196	M 196	M 196	N/A	N/A
1.2 (a)	Corrugated aluminum pipe arch. (1)	M 197	M 197	M 197		
1.3	Corrugated polyethylene (HDPE) pipe	M 294 ASTM D 3350	M 294 ASTM D 3350	M 294 ASTM D 3350	N/A	N/A
<b>2.0</b>	<b>Smooth-Lined Pipe and Pipe Arch:</b>					
2.1	Concrete lined corrugated steel pipe  (Use Type V cement. Refer to Section 03055)	M 36	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 250 µm (inside) /250 µm (outside) M 245 & M 246 ASTM A 849	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 250 µm (inside) /250 µm (outside) M 245 & M 246 ASTM A 849	N/A	N/A
2.2	Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter	M 294 ASTM D3350	M 294 ASTM D3350	M 294 ASTM D3350	N/A	N/A
2.3	Smooth lined Polyvinyl chloride (PVC) pipe	M 304 Cell Class # 12454C ASTM D 1784	M 304 Cell Class # 12454C ASTM D 1784	M 304 Cell Class # 12454C ASTM D 1784	N/A	N/A
2.4	Asphalt smooth lined corrugated steel pipe	M 36	M 36 Asphalt Coating (Type D) M 190	M 36 Asphalt Coating (Type D) M 190	N/A	N/A
2.4 A	Pipe arch					

Pipe Type		Pipe Class				
		A	B	C	D	E
<b>Substitutions: Class B and C may be substituted for Class A, Class C may be substituted for Class B or A, Class E may be substituted for Class D.</b>						
2.5	Spiral rib steel pipe	M 36	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 0µm (inside) / 250 µm (outside) M 245 and M 246, ASTM A 849 or Aluminized Type II Steel M 274 (2)	M 36 Asphalt Coating (Type A) M 190 OR Polymeric Coating 250 µm (inside)/250 µm (outside) M 245 and M 246 ASTM A 849	N/A	N/A
2.5 a	Spiral rib steel pipe arch					
2.6	Spiral rib aluminum pipe and pipe arch	M 196 and M 197	M 196 and M 197	M 196 and M 197	N/A	N/A
2.7	Reinforced concrete pipe	M 170 Type II Cement	M 170 Type II Cement	M 170 Type V Cement required	N/A	N/A
2.8	Non-reinforced concrete pipe	M 86 Type II Cement	M 86 Type II Cement	M 86 Type V Cement required	N/A	N/A
2.9	Elliptical reinforced concrete pipe	M 207 Type II Cement	M 207 Type II Cement	M 207 Type V Cement required	N/A	N/A
<b>3.0</b>	<b>Structural Plate Pipe and Pipe Arch:</b>					
3.1	Structural steel plate pipe and pipe arch	N/A	N/A	N/A	M 167	M 167 M 243
3.2	Aluminum alloy structural plate pipe and pipe arch	N/A	N/A	N/A	M 219	M 219
<b>Footnotes:</b> (1) Minimum corner radii conforming to the details shown on the standard drawings. (2) Acceptable Soil Conditions, Class B, Aluminized Type II Steel are: 1.6mm minimum thickness of metal acceptable where pH is greater than 7 and less than 8.5, and soil resistivity is greater than 1500 ohm-centimeters.						

## **2.2 PIPE TYPES**

- A. Pipe, Pipe Arch, Structural Plate Pipe and Structural Plate Pipe Arch Types:  
Refer to Table 3.

## **2.3 RELATED PRODUCTS**

- A. Asphalt Coating: Furnish Material Class M-Mastic, either asphalt or tar base, cold applied. ASTM A 849.
  - 1. Asphalt base mastic design criteria:
    - a. Functions as a cool-applied waterproofing membrane.
    - b. Provides a protective coating to aluminum or steel highly resistant to corrosion and chemical fumes.
    - c. Is not affected by freezing temperatures and does not flow in hot weather.
    - d. Has high cohesive strength and readily hardens in to a tough elastic seal after application.
    - e. Is mixed until the mineral stabilizers and fillers are uniformly dispersed. Follow AASHTO M 243.

## **2.4 PIPE SELECTION**

- A. At the preconstruction conference, declare choice of pipe, type, diameter and thickness to be used.
- B. Use the same type and strength of concrete pipe or thickness of steel, aluminum, polyethylene or polyvinyl chloride (PVC) pipe for the entire run of pipe.
- C. Use the maximum height of cover to determine the strength or thickness. Refer to the DG series Standard Drawings.
- D. Do not use aluminum pipe when a paved invert is required, unless protective measures are taken. Follow this Section, Article 3.7, Structural Plate Pipe and Plate Pipe Arch, paragraph C.
- E. Corrugated and smooth-lined high density polyethylene pipes: Use only HDPE Plastic Pipe up to 60-inch diameter, that currently meets AASHTO M 294 requirements and is certified by AASHTO National Transportation Product Evaluation Program (NTPEP). Provide a copy of NTPEP test results to the Engineer.

- F. Corrugated and smooth-lined PVC pipes: Use up to 36inch diameter.
- G. Furnish Material Pipe Coating Class M-Mastic, either asphalt or tar base, cold applied. ASTM A 849.
- H. Precast, non-reinforced concrete pipe: Use only 18-inch to 36-inch diameter.
- I. Do not allow pipes of different types of metal to contact each other. Use matching materials to make direct extensions of existing pipes.
- J. Do not use pipe containing longitudinal lap seams if watertight pipe or watertight joints are called for.
- K. Do not use thermoplastic pipe manufactured without UV inhibitors approved by the Materials Engineer in applications subject to direct sunlight.

## **2.5 JOINTS OR COUPLING BANDS FOR PIPES**

- A. General:
  - 1. Furnish pipes with joints that can sustain 5 psi minimum pressure, lab tested, for all cross culverts; furnish pipe with joints that can sustain 10 psi minimum pressure, lab tested according to the proper AASHTO and ASTM test requirement for each pipe type, for all stormdrain and irrigation pipes.
  - 2. Comply with manufacturer's recommendations for connecting pipes and for connecting pipes to concrete headwalls, catch basins, and similar structures.
- B. Concrete Pipes:
  - 1. Meet AASHTO M 198.
- C. Metal Pipe:
  - 1. Refer to DG series Standard Drawings.
  - 2. Conform to AASHTO Standard Specifications for Highway Bridges and AASHTO M 36 or AASHTO M 245 with the following modifications:
    - a. Use connecting bands of the same class as the pipe. Maintain a minimum thickness of 0.064 inch for the connecting bands.
    - b. Use bands with projections (dimple bands) only in extension of existing pipes where annular corrugations do not exist.
    - c. The ends of helically corrugated pipe must be re-rolled to form at least two full annular corrugations each before being joined.
    - d. Use flat bands only when approved in writing by the Engineer.
    - e. Follow DG series Standard Drawings.

- D. Joints for Polyethylene (HDPE) Pipe: Unless otherwise specified, use standard joints conforming to Section 7, Requirements, and Section 9, Test Methods of AASHTO M 294 and tested in the lab in accordance with ASTM D3212.
- E. Joints for PVC Pipes: Show no leakage when tested in accordance with ASTM D 3212. Meet ASTM F 477 for gaskets
- F. Provide HDPE joints that can sustain in the lab 5 psi minimum pressure for all cross culverts and 10 psi for all drainage and irrigation pipe and sewer pipes..

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Excavating, Trenching, Bedding and Backfill:
  - 1. Refer to Section 02317.
  - 2. Refer to DG series Standard Drawings.
  - 3. Comply with Utah Occupation Safety and Health regulations when excavating and trenching. Note safety restrictions for trenches deeper than 4 feet. Follow Section 00820.
  - 4. Use Type I bedding unless Type II or Type III is required due to foundation conditions.

### **3.2 INSTALLATION**

- A. Follow manufacturer installation requirements for installing all types of pipe.
- B. Follow the following installation guidelines. Consult with the Resident Engineer when conflicts arise with the following and manufacture's guidelines.
  - 1. Lay pipe starting at the downstream end.
  - 2. Keep the bottom of the pipe in contact with the bedding throughout its length.
  - 3. When indicated on the drawings, camber pipe upward from a chord through the inlet and outlet inverts an ordinate amount equal to one percent of the pipe length. Develop camber on a parabolic curve. If the mid-point elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe gradient.
  - 4. Place bell or socket end of pipe facing upstream.
  - 5. Place pipes fabricated with longitudinal laps or seams so that such seams are located approximately 45 degrees away from the invert or crown.

6. Place paved invert or partially lined pipe so that the centerline of the paved segment matches the flow line.
7. Place elliptical pipe with the major axis within five degrees of a vertical plane through the longitudinal axis of the pipe.
8. Place outside circumferential laps of flexible corrugated (annular corrugations) pipe facing upstream.
9. Close the joints to meet the specified joint integrity in accordance with manufacturer's recommendations.
10. Install pipe to conform to AASHTO Standard Specifications for Highway Bridges:
  - a. Section 26 for Corrugated Metal Pipe
  - b. Section 27 for Concrete Pipe
  - c. Section 30 for Thermoplastic Pipe

### **3.3 SMOOTH LINING FOR CORRUGATED STEEL PIPE AND PIPE ARCH**

- A. Clean all surfaces to be lined including removal of all oil and grease from the metal. Allow the surface to dry before proceeding.
- B. Concrete Lining: Follow ASTM A 849, Subsections 5 and 9.
- C. Asphalt Lining: Follow Table 3.

### **3.4 PIPE AND PIPE ARCH**

- A. Follow AASHTO M 243.
- B. Use materials described in Table 3.
- C. Remove moisture, dirt, oil, un-bonded or incompatible paint, grease residual oil, alkalies, or other foreign matter from the surface to be coated.
- D. Spray or brush-coat all aluminum pipe contacting concrete with an asphalt mastic or tar base material to a minimum thickness of 0.05-inch.

### **3.5 STRUCTURAL PLATE PIPE AND PLATE PIPE ARCH**

- A. Use materials described in Table 4.
- B. Repair or replace all damaged plates or coatings before installation.
- C. Installation: Follow DG series Standard Drawings. Embankment: Refer to Section 02330.

- D. Assembly:
1. Give the Engineer a copy of the detail plan showing the position of each plate and the assembly order.
  2. Follow the manufacturer's instructions.
  3. Clearly mark each modified plate, designating its position in the finished structure.
  4. Place outside circumferential pipe-laps facing upstream.
  5. Attain approved seam fit-up. All bolts must be in place and have a torque according to manufacturer's recommendation.
  6. Form structural plates so that the finished pipe is elliptical with the vertical diameter of round pipe approximately 5 percent greater than the nominal diameter.
- E. Asphalt Coating (structural plate pipe, and plate pipe arch, and arches):
1. Thoroughly clean all plates to be coated. Remove any oil or grease from the surface of the plates. Keep plates clean and dry prior to coating.
  2. Apply coating to dry plates:
    - a. Spray or brush-coat the entire exterior surface of the pipes with an approved post-applied mastic coating to a minimum 0.08 inches wet thickness. Follow AASHTO M 243.
    - b. Spray or brush-coat the inside invert for 1/4 of the circumference of round pipe and the full span width of pipe arch with the same compound.
    - c. Spray or brush coat all metal surfaces in contact with the ground at the time of erection before assembly. The remaining surfaces may be treated after erection.
  3. Apply uniformly to a minimum thickness of 0.06 inches dry thickness to structural plate for pipe, pipe arches, or arches on inside and outside surfaces measured on the crest of the corrugations.
  4. Furnish as follows, according to the application used:
    - a. Spraying consistency: Spray with an air gun without the use of additional thinners when temperatures are 39 degrees F and above.
    - b. Troweling consistency: Apply with a knife or trowel.
    - c. Brushing consistency: Apply with an ordinary roofing brush.

### **3.6 INVERT PROTECTION**

- A. Paved Invert:
1. Use corrugated steel pipe or pipe arch and structural steel plate pipe or plate pipe arch.
  2. Complete backfill and embankment over the pipe before placing paved invert material.
  3. Use 10-gage wire fabric with wire spaced at 6-inch centers. Refer to AASHTO M 55.

4. Arc-weld the wire mesh reinforcement to the corrugation at not more than 2 ft centers.
5. Place concrete at least 2 inches above the crest of the corrugations, at least 1/4 of the circumference of round pipe, or the span width of arch pipe. Refer to Section 03055.
6. Finish the concrete to a floated surface finish. Follow Section 03310.
7. After curing, coat the joint between the pipe and concrete with liquid asphalt at a rate 0.9 gal/yd<sup>2</sup> of residual asphalt. Coat 6 inches above and below the joints.

### **3.7 QUALITY CONTROL**

- A. Provide adequate cover or protection for all pipe during project construction. Replace all damaged pipe before acceptance by the Department.
- B. The following constitute poor workmanship and any one is cause for rejection:
  1. Irregular or distorted shape (not as provided or designed)
  2. Dents or bends
  3. Damaged, broken, delaminated or scaled coating
  4. Loose bolts or nuts
  5. Uneven laps
  6. Improper fitting joints
  7. Any damage which compromises the functionality and design life of the pipe.
- C. Coatings:
  1. Furnish a Certification of Compliance from the manufacturer.
  2. Department will take a representative sample from each lot furnished to conduct verification testing.
- D. Joints: Furnish a Certificate of Compliance from the manufacturer of the type specified.

END OF SECTION

**Supplemental Specification  
2004 Standard Specification Book**

**Section 02748M**

**PRIME COAT/TACK COAT**

**Delete article 2.2 and replace with the following:**

**2.2 TACK COAT**

- A. Cutback or emulsified asphalt of the type and grade called for in the bid proposal and Section 02745.
  - 1. Emulsified asphalt per Section 02745, diluted 2:1 (two parts concentrate to one part water) by the manufacturer.
    - a. Dilute at terminal only. Water in excess of that required for 2:1 dilution is not measured or paid for.
- B. Tack coat referred to for paving fabrics is a PG 58-22 or PG 64-22.
- C. Do not use an emulsion or cutback in paving fabric placement.

**Delete article 3.3 and replace with the following:**

**3.3 TRAFFIC CONTROL**

- A. Refer to Section 01554.
- B. Maintain the prime coat/tack coat until the next course is placed.
- C. Keep all traffic off the prime coat until it has cured and dried.

**Supplemental Specification  
2004 Standard Specification Book**

**Section 06055**

**TIMBER AND TIMBER TREATMENT**

**Delete Section 06055 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Timber for signs, guardrails, and posts, and the preservative treatment for timber.

**1.2      REFERENCES**

- A.      AASHTO M 133: Preservatives and Pressure Treatment Processes for Timber
- B.      AASHTO M 168: Wood Products
- C.      AASHTO Standard Specifications for Highways and Bridges
- D.      American Wood-Preservers' Association (AWPA) Book of Standards
- E.      Western Wood Products Association (WWPA) Standard Grading Rules

**PART 2      PRODUCTS**

**2.1      STRUCTURAL TIMBER, LUMBER**

- A.      As specified in AASHTO M 168.
- B.      Treat if required following AASHTO M 133.

**2.2      POSTS**

- A.      Wood posts that comply with the current WWPA Standard Grading Rules.
- B.      Pressure treated.

- C. Sign posts:
  - 1. Use only one type of wood species on any one project.
  - 2. S4S, 80 percent FOHC, Douglas Fir-Larch, Grade No. 2 or better.
  - 3. Hem-fir, Lodgepole Pine, or Ponderosa Pine, Grade No. 1 or better.
- D. Guardrail Post:
  - 1. Surfaced or rough-sawn posts and offset blocks.
  - 2. Use only one species of wood on any one project.
  - 3. Douglas Fir-Larch, Hem-Fir, Lodgepole Pine, or Ponderosa Pine.
  - 4. Grade No. 1 or better.
- E. Steel Post with Wood Block:
  - 1. Routed wood offset block of Southern Yellow Pine.
  - 2. Surfaced or rough sawn blocks.
  - 3. Grade No. 1.
- F. Mailbox Post: Provide new material for post, shelf, and brace.
  - 1. Sound fir, hemlock, or pine.
  - 2. Free from all decay, splits, or other defects that would weaken the material.
  - 3. Dimensions as shown on the plans.

## **2.3 TREATMENT**

- A. Meet AASHTO Standard Specifications for Highway Bridges and AASHTO M 133.
- B. Meet AWP standards for treatment type and quality.
- C. Use rodent-repellent treatment for any timber in contact with the ground.
- D. Apply salt treatment to mailbox post and lumber requiring painting.

## **PART 3 EXECUTION**      Not used

END OF SECTION